GeoComm

been there.

North Dakota Centerline Validation project

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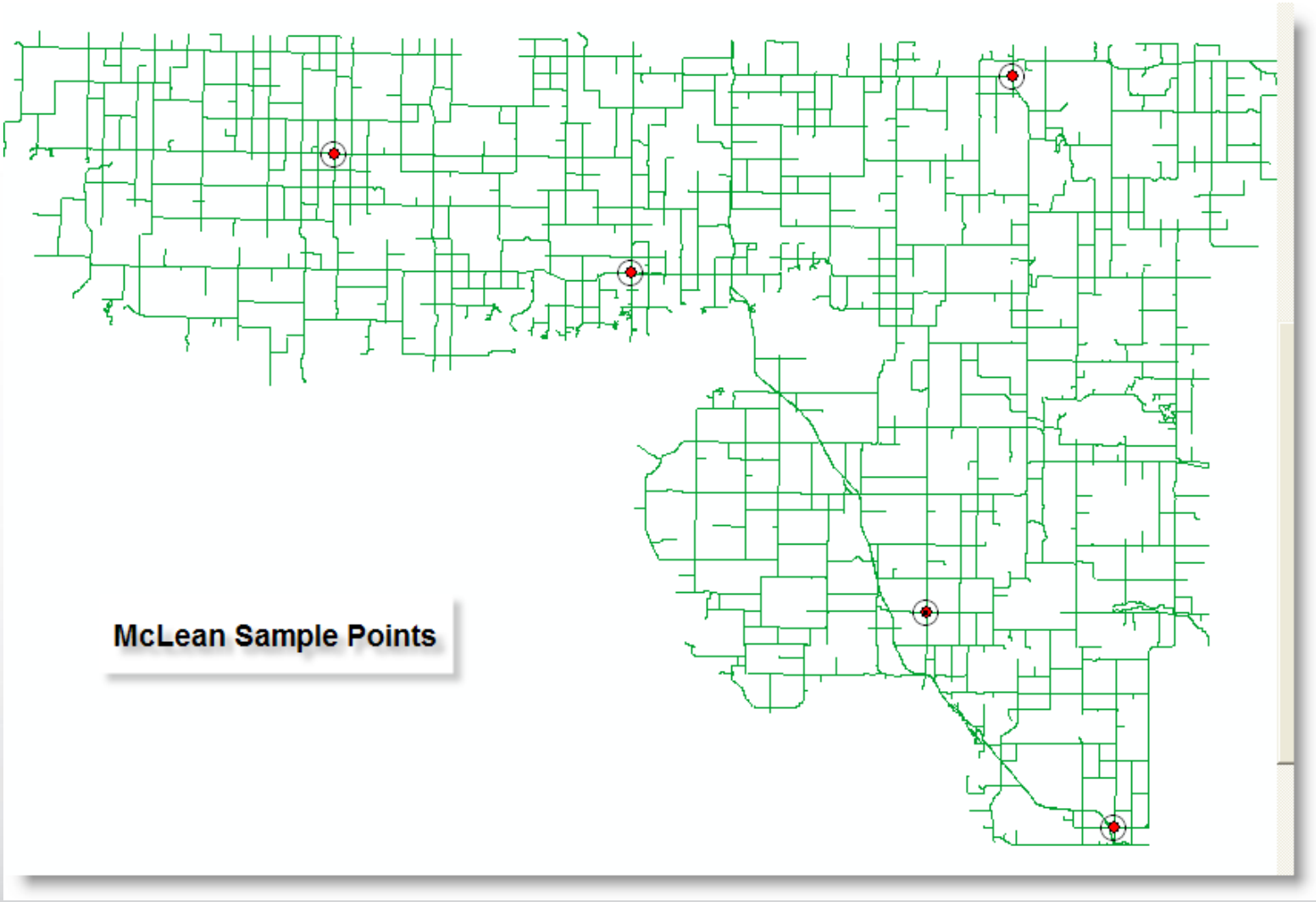
Statement of Work

- Data validation
  - Spatial accuracy
  - Attribute accuracy
  - Road miles
- Address point development (Optional)
- Project management
  - Development
  - Maintenance

County Classification

Classification	Definition	Spatial Development	Attributes Development
A	Spatial and attribute data meet recommended standards	None	None
B	Spatial data do not meet recommended standards, attributes meet standard	Spatially adjust existing segments	None
C	No existing data or spatial and attribute data do not meet recommended standards	Create new centerline segments	Develop required attribute information from resources and data gathered in the field

Spatial Validation



Results

- Reported Accuracy

County	2003 Survey	2007 Survey
Bottineau	Sub-Meter	1 Meter
Golden Valley	1-3 Meter	1 Meter*
McLean	Sub-Meter	Did not report accuracy

- Results

County	NSSDA Accuracy Level	Meet State Standard
Bottineau	8.2385 Meters*	No
Golden Valley	8.4144 Meters	No
McLean	3.23 Meters	No

Recommendations
Observations

- NSSDA specific accuracy testing was cost and time prohibitive
- Three test counties did not pass spatial validation test based on minimal data collection. Reclassified according to scope of work and other findings
- All three counties use mapping grade GPS equipment for data development according to 2007 survey and reported meter to sub-meter accuracy
- Acceptance of reported accuracy may be cost beneficial
- Options if reported accuracy not accepted
- Retest counties using specific NSSDA standards keeping in mind that testing can be expensive
- Recreate spatial data for “A” counties at state accuracy levels and transfer attributes

Attribute Validation

- Collect address points in nine sample counties – GPS
- “A” or “B” counties
- Volume based on 2% of households
- 75 point minimum

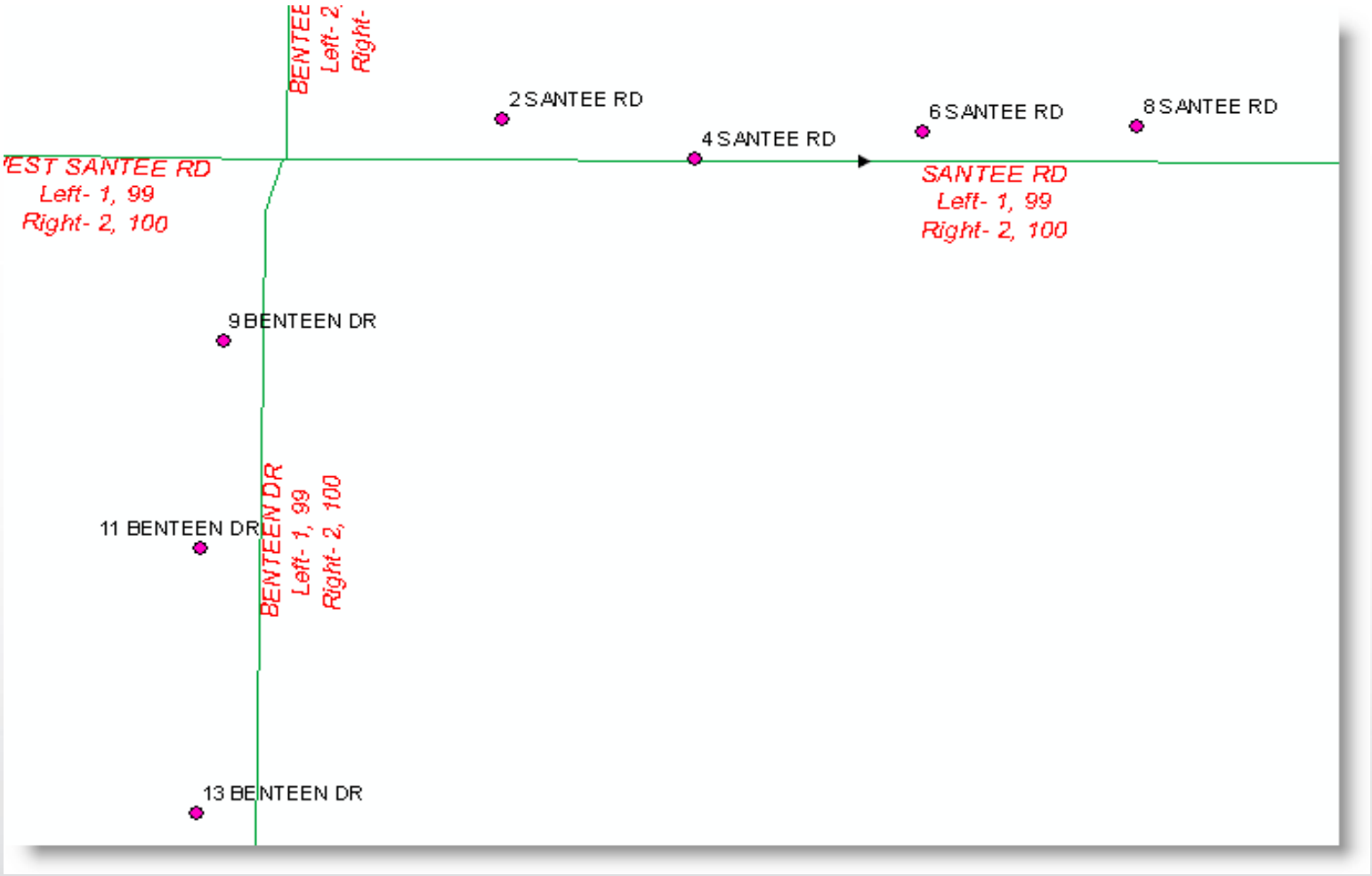
Procedures

- Confirmed address attributes available in data
- Standard range discrepancies
- Review accuracy of ranges
- Compared geocoded address to assigned address
- Acceptable variance
  - Based on addressing grid (100 per mile or 1200 per mile)
  - 1/10 of a mile (528 feet)
  - How many assigned addresses fall outside of the variance?

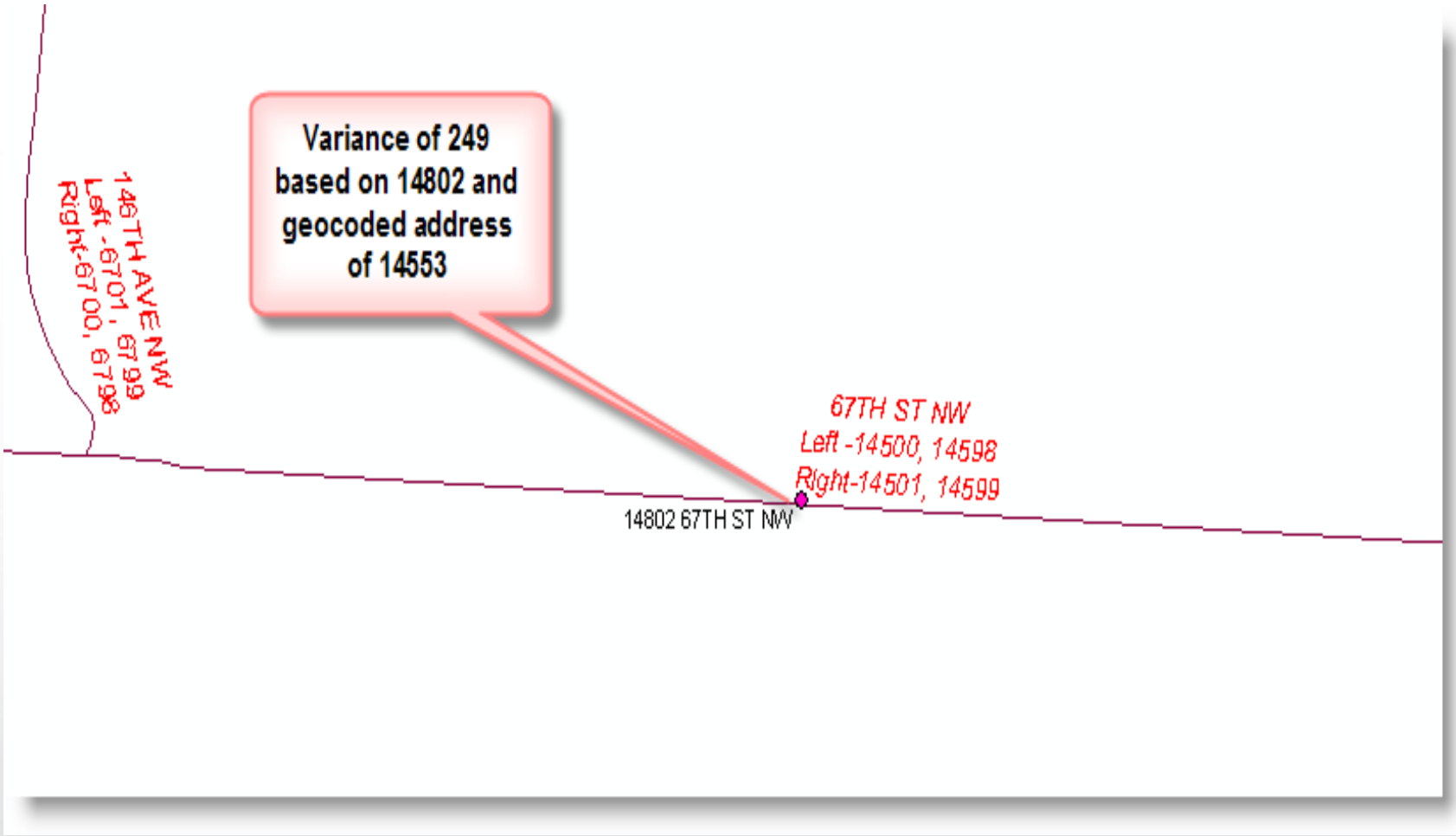
Range Discrepancy

County	Segments in Centerline	Range Issues (odd/even)	Segments with Overlap
Burleigh	27395	18	879
Morton	4519	49	448
Cass	13581	39	970
Ransom			
Grand Forks	6398	59	1389
Walsh	4598	25	413
Pembina	3523	18	203
Billings	4005	4	36
Williams	5283	6	558

Example Range Issue



Variance Example



Results

County	Total Points	Address Visible	No Address	Number of Discrepancies	Percent of Sample Outside of Acceptable Variance
Billings*	105	35	70	34	97.14%
Burleigh	344	329	15	95	28.88%
Cass	635	424	211	174	41.04%
Grand Forks	272	258	14	96	37.21%
Morton	283	247	36	49	19.84%
Pembina	116	74	42	13	17.57%
Ransom**					
Walsh	201	150	51	25	16.67%
Williams	163	124	39	31	25.00%

*Billings County data did not contain address ranges in an area where 25 points were collected.
** Ransom County did not provide data for the validation study. Seatol provided data for the 2007 report which did not contain address ranges. GeoComm collected sample data in Ransom County.

Recommendations
Observations

- Reclassification of Ransom and Billings to “C” as a function of attribute issues observed during the validation process
- The majority of the attribute issues reviewed in the sanity check were a function of original address assignment.
- In areas where geocoded addresses exceeded the variance a combination of original address assignment and inclusive address range assignment (100-199, 200-299, etc.) could be affecting the results. The higher addresses per mile, the more forgiving the address assignment process. If you only have one address every 52.8 feet, which is the case in the majority of the state, small address variance is magnified.
- To achieve a closer geocoded location, actual address ranges could be applied to the centerline file (100-132, 200-87, etc.).
- Acceptable variance could be raised due to the distribution of addresses in the rural area.

Recommendations
Observations

- Actual versus inclusive address ranges are a function of the attribute standards adopted by the state. NENA recommendations call for valid address ranges. Actual versus inclusive are based on local standards. http://www.nena.org/pages/Content.asp?CID=76&CTID=5, Document 02-014.
- Address sample points that exceeded the acceptable variance (1/10 of a mile) should be reviewed by the local jurisdictions. Adjustments in house numbers or address ranges are a decision for the local jurisdiction.
- Sample points that exceed the ranges per mile (100) should be reviewed by the county for possible ranging or address assignment issues. If the variance is more than the address ranges, the geocoded location could be within a different block range.

Road Mile Validation

- Road mile estimates
- Local county departments
- StreetWorks
- State Treasurer's Department
- DOT
- Census Bureau, TIGER 2006 2nd Edition

Final Calculation

- Hybrid of two calculation
  - County data
  - Census Bureau, TIGER 2006 2nd Edition
    - Removal of defined CFCC codes
    - Decreased county values by 20%

Estimated Miles	Miles
Using County data	36,127.9
Using Census data	66.284.8
TOTAL	**102,412.7**

Centerline Development

- Adjustment to county classifications based on validation study and review of 2007 results.
- Adjusted road miles based on a hybrid of county miles where data was provided by the county and adjusted Census Bureau, TIGER 2006 2nd Edition.

Optional Point File Development

- Assumed all counties need development and maintenance
- 68,162 - Estimated address points for rural North Dakota
- Collecting address points via GPS at the location where habitable, unincorporated structure's driveways intersect with the named road (GPS data collection would meet state accuracy standards)
- Attributing address points with addresses obtained in the field while collecting GPS points - Resident Surveys

Final Recommendations

1. Reclassify the three sample counties participating in the spatial validation project.
2. Deliver validation reports back to the county for review and possible adjustment:
    a) All discrepancies greater than the address per mile should be reviewed for possible adjustment in map data or addressing
    b) Range overlaps
    c) Odd/even addressing issues
    d) Odd/even ranging issues
3. Include a data synchronization analysis in the development costs.
4. Do not adjust the inclusive ranging in the existing county data.
5. Data development (C counties) should also be inclusive ranging

Final Recommendations

6. Address point development would be beneficial if funding is available and made in addition to the centerline data
7. Estimated road mile process was based off of sound analysis processes. RFP language can be developed to protect the cost estimates for the state
8. Third party project management will provide expertise in centerline development and maintenance for public safety while ensuring the quality of the product delivered by the vendor(s)

Final Cost Estimates Development

Development		
Component	**Time Estimate (hr)**	**Cost Estimate**
Analysis Report for synchronization only (A counties)	259	$16,945
Routing A counties		$14,300
Spatial realignment of county centerline to GPS and Routing (B counties)	6097	$502,538
Full development and Routing (C counties)	22,387	$1,698,159
Centerline Development		**$2,231,942**
Project management – state level	N/A	$90, 120
Optional Address points (all counties)	28,742	$1,251,814
		Average $23,620 per county

Final Cost Estimates Maintenance

Maintenance		
Component	**Number of Counties**	**Cost Estimates**
**Maintenance program meets state standards (A)	11	$0
Maintenance program requires GPS equipment upgrade (B) $6,073 (hardware/software/training)	10	$65,000
No maintenance program requires third party (C)	32	$234,410
Annual project management – state level		$56,180
Address point maintenance		$370,940*
		Average $7,000 per county

TOTAL COSTS

Estimated Project Totals		
Component	**Development**	**Maintenance (Annual)**
Centerline w/ Project Management	**$2,322,061**	**$290,590** **(Add $65,000 first year – GPS)**
Optional Address Point File	**$1,251,814**	**$370,940***

*Price based on address point maintenance alone. Cost savings if done in conjunction with centerline maintenance. If centerline and point data collection at same time for could expect approximately 25% savings over the combined maintenance cost.